

Direct Drive Robot Safety Guide

About this guide

This guide describes the potential safety hazards of the Direct Drive Robot and how to avoid them. This guide is for anyone who will install, operate, and service the Direct Drive Robot.

This guide contains the following topics:

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General safety information

Before installing and using the Direct Drive Robot

The Direct Drive Robot is designed for safe operation. Under normal operating conditions, you are protected from moving parts and hazardous voltage. However, you must be aware of the potential hazards and understand how to avoid being exposed to them.

Before installing and using the Direct Drive Robot, make sure you are properly trained in the correct and safe installation and operation of the robot.

Intended product use



WARNING Do not remove the Direct Drive Robot exterior covers or otherwise disassemble the robot. Doing so can cause injuries and damage the Direct Drive Robot.

Agilent Technologies products must only be used in the manner described in the Agilent Technologies product user guides. Any other use may result in damage to the product or personal injury. Agilent Technologies is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent Technologies product user guides, or use of the products in violation of applicable laws, rules or regulations. Except as otherwise expressly provided in Agilent Technologies product user guides, any alteration, adjustment or modification to the products will void the product warranty.

The Direct Drive Robot is not intended or approved for diagnosis of disease in humans or animals. You assume full responsibility for obtaining any regulatory approvals required for such use and assume all liability in connection therewith.

Safety and regulatory certifications

Certifications and declarations

EMC

This product complies with European EMC Directive 2004/108/EC

- IEC/EN 61326-1
- CISPR 11 Group 1, class A
- AS/NZS CISPR 11
- ICES/NMB-001

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme a la norme NMB-001 du Canada.

Safety

This product complies with European Low Voltage Directive 2006/95/EC

- IEC/EN 61010-1 2nd Edition
- Canada: CSA C22.2 No. 61010-1
- USA: UL 61010-1 2nd Edition

The Agilent Technologies Direct Drive Robot meets the following IEC (International Electro-technical Commission) classifications: Equipment Class I, Laboratory Equipment, Installation Category II, Pollution Degree 2.

Electromagnetic compatibility

If the robot causes interference with radio or television reception, which can be determined by turning the robot off and on, try one or more of the following measures:

- Relocate the radio or television antenna.
- Move the device away from the radio or television.
- Plug the device into a different electrical outlet, so that the device and the radio or television is on separate electrical circuits.
- Make sure that all peripheral devices are also certified.
- Make sure that appropriate cables are used to connect the device to peripheral equipment.
- Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.
- Changes or modifications not expressly approved by Agilent Technologies could void the user's authority to operate the equipment.

Sound emission declaration

Sound pressure: $L_p < 70$ dB according to EN 27779:1991.





Schalldruckpegel: $LP < 70$ dB nach EN 27779:1991.

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Emergency stop

Symbols

Warnings in the user documentation or on the instrument must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions violates safety standards of design and the intended use of the product. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

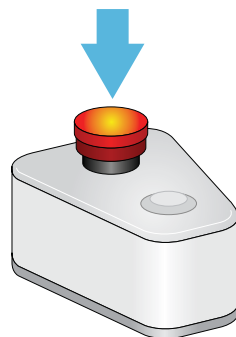
Symbol	Description
	See accompanying instructions for more information.
	Indicates hazardous voltages.
	Indicates pinch, crush, and cut hazard.
	Indicates that you must not discard this electrical/electronic product in domestic household waste.

Emergency stop

The Direct Drive Robot is equipped with an emergency stop pendant. Pressing the red button on the pendant cuts power to the robot motors and stops the robot during an emergency.

If the robot is integrated with other devices in a system, Agilent Technologies recommends that you install a main emergency stop button to cut power to the robot and all devices simultaneously.

Figure Emergency stop pendant.



High-force hazards

The Direct Drive Robot has relatively low inertia and is designed to stop its movement when it comes in contact with an obstacle. However, you can be injured if you obstruct the robot while it is in motion.

Agilent Technologies highly recommends that you install the robot inside an enclosure. Safety-interlocked doors or light curtains that stops the robot when opened or interrupted can be used to further mitigate risk. Make sure the safety-interlocked enclosure complies with your country's safety regulations.

Mechanical hazards

Moving-parts hazards

The following diagram shows the robot's maximum radial and vertical reach. The radial reach includes a typical microplate held in portrait orientation.

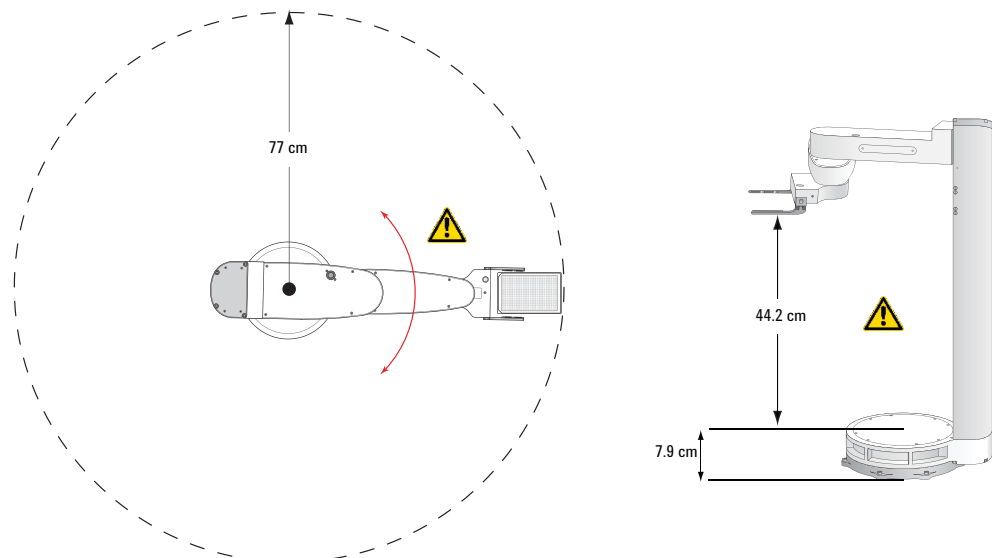


WARNING Keep clear of the robot's reach when it is in motion. Keep your fingers, hair, clothing, and jewelry away from the robot while it is in motion.



WARNING The robot does not always move in a straight line between teachpoints. Do not try to predict the robot's movements and reach into the robot's travel space while it is in operation.

Figure Direct Drive Robot radial (top view) and vertical reach (side view).

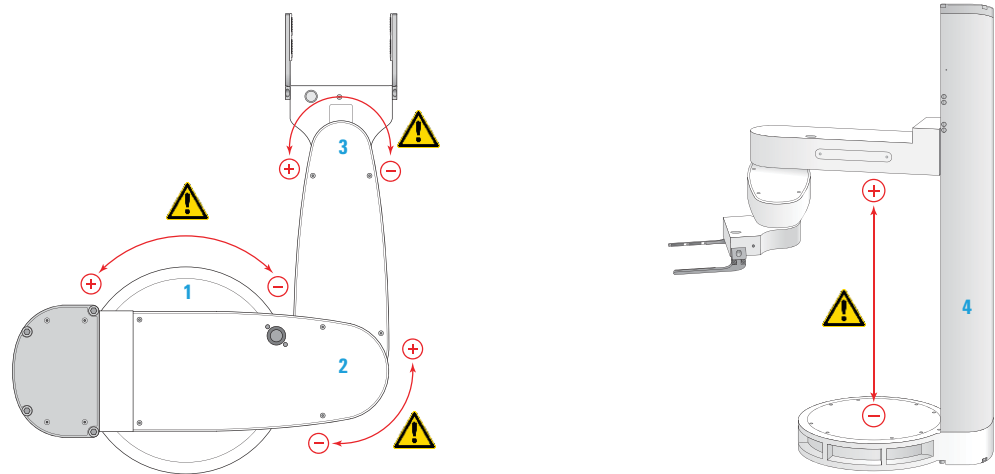


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Mechanical hazards

Pinch hazards

The Direct Drive Robot has four axes of motion:



Item	Axis	Description of robot movement
1	Waist	Robot arm rotates infinitely about the waist.
2	Elbow	Robot forearm rotates infinitely about the elbow.
3	Wrist	Robot hand rotates infinitely about the wrist.
4	Mast	Robot arm moves up and down along the mast.



WARNING Keep clear of the robot while it is in motion. The robot could pinch or bruise you near the axes.

Puncture hazards

The tapered robot grippers and the robot's low inertia are features that are designed to prevent puncture or other injuries. However, you can be injured if you obstruct the robot while it is in motion.



WARNING Keep clear of the robot and its grippers while it is in motion.

Electrical hazards

Hazardous-voltage electronics

Hazardous-voltage electronics can be found within the Direct Drive Robot and the power supply unit. Under normal operating conditions, you are protected from exposure to the hazardous voltage.



WARNING Do not try to gain access to the interior of the Direct Drive Robot or its power supply. Do not remove panels for any reason. Exposure to the interior electronics of the robot or its power supply can cause severe injury.



WARNING Ensure that the power cord and robot cable are in good condition and are not frayed. Use of a frayed or damaged power cord and robot cable can cause injury. Use of incorrect power cord can cause damage to the robot.



WARNING Always turn off electrical power and disconnect the power cord before installing or servicing the robot.

Specifications

Robot dimensions

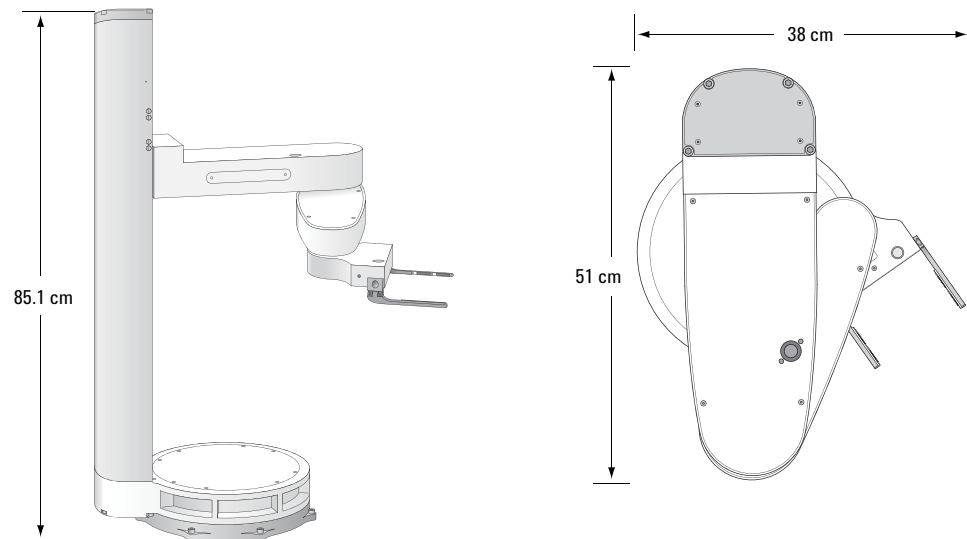
Dimension	Value
Height	85.1 cm (33.5 in)
Width (home position)	51 cm (20 in)
Depth (home position)	38 cm (15 in)
Weight	31.1 kg (68.5 lb)

Robot cable: 2.4 m (8.0 ft), 1.2 kg (2.6 lb)

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Specifications

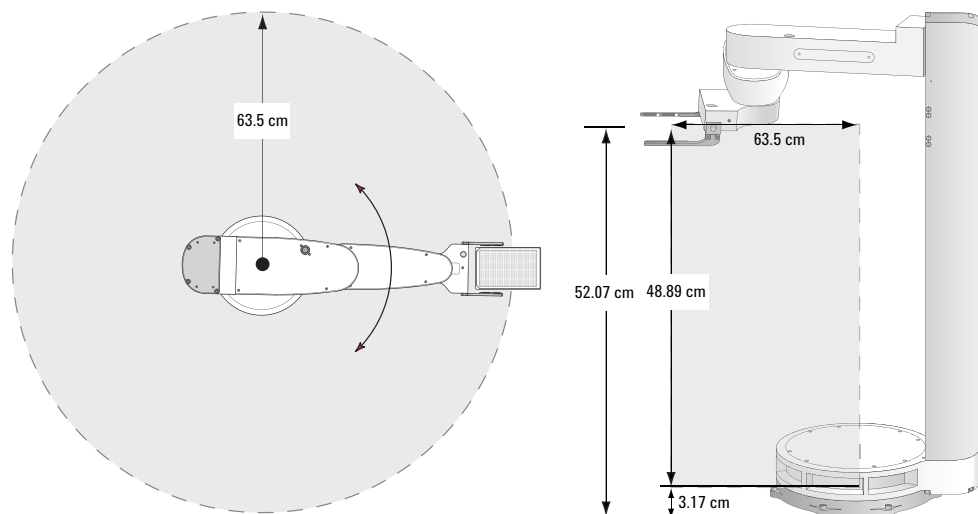
Figure Direct Drive Robot dimensions.



Robot reach and workspace

Maximum reach	Value
Radial reach	63.5 cm (25.0 in) (center of rotation to center of microplate)
Vertical reach	3.17–52.07 cm (1.25–20.50 in) (measured from the attachment surface)

Figure Direct Drive Robot reach and workspace.





Mounting specifications

Attachment surface

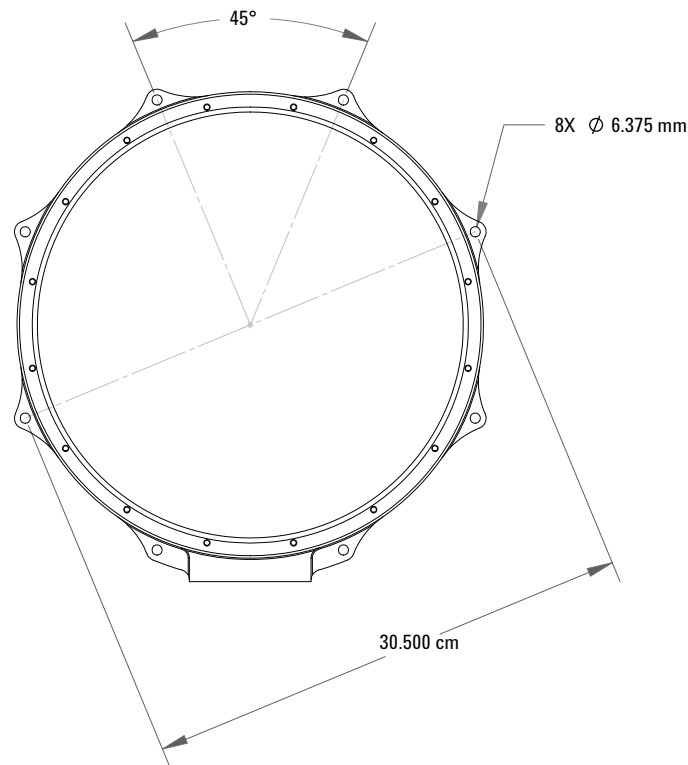
The Direct Drive Robot must be installed vertically on a flat stiff surface that is stable. A deformable and non-stable support will greatly reduce the robot's speed and accuracy, and possibly cause errors.

Mounting bolts

Eight bolts are required to hold the Direct Drive Robot to the attachment surface. The following diagram shows the base of the robot and the spacing of the holes for the bolts.

- Hole diameter: 6.375 mm (0.251 in)
- Bolt type: M6 × 1

Figure Direct Drive Robot base.



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Specifications**Power supply dimensions**

Dimension	Value
Height	14.0 cm (5.5 in)
Width	44.4 cm (17.5 in)
Depth	50.8 cm (20.0 in)
Weight	13.8 kg (30.4 lb)

Power cord: 2 m (6 ft)

Emergency stop pendant dimensions

Dimension	Value
Height	8 cm (3 in)
Width	8 cm (3 in)
Depth	13 cm (5 in)

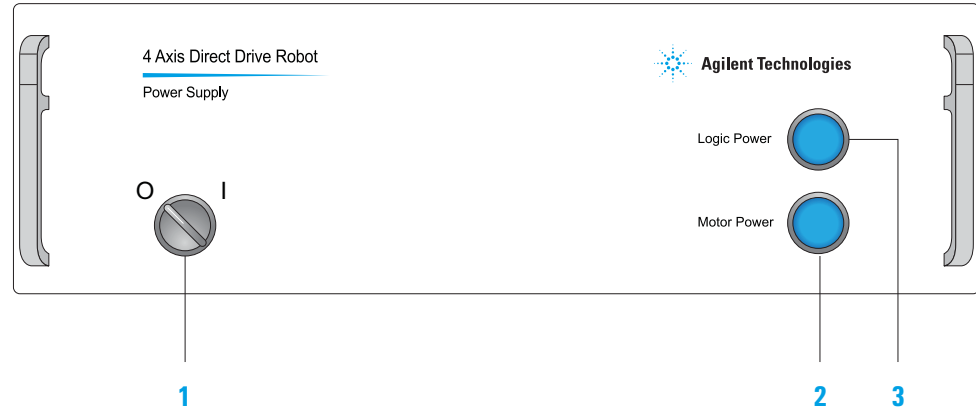
Emergency stop pendant cable: 2 m (6 ft)

Electrical requirements

Requirement	Value
Voltage	120–240 VAC
Frequency	50/60 Hz
Current	10 A
Power consumption	200 W typical
Fuses	<ul style="list-style-type: none">• <i>Main.</i> 2 × 10 A, time delay• <i>Logic power.</i> 2 A, time delay• <i>Robot.</i> 5 A, time delay• <i>Emergency stop pendant.</i> 0.8 A, time delay
Chassis plug	IEC 60320 C14

Power switch and indicator lights

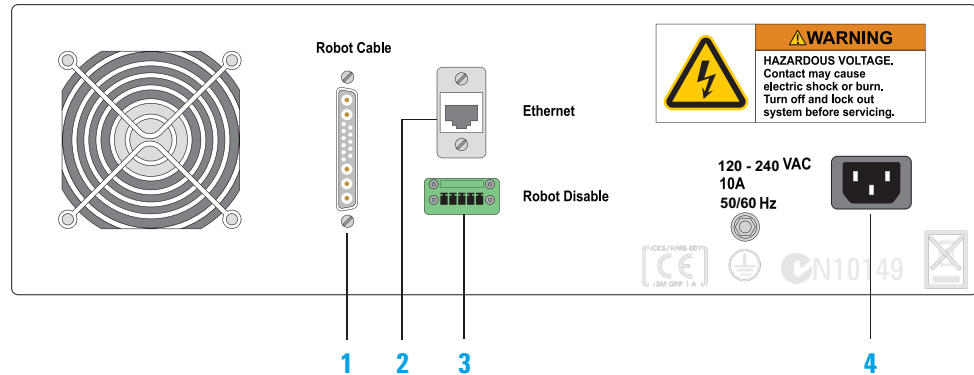
The following diagram shows the front of the robot power supply.



Item	Label	Description
1	Power	Power switch. To turn on the robot, turn the switch to the on (I) position. To turn off the power, turn the switch to the off (O) position.
2	Motor power	Robot motor indicator light. When the light is on, the robot motor is enabled. When the light is off, the robot motor is disabled. To enable or disable the robot, use the Enable robot motor or the Disable robot motor button in the DDR Diagnostics software.
3	Logic power	Robot power indicator light. When the light is on, the robot power is on. If the light is off, the robot power is off.

Power and communication connections

The following diagram shows the back of the robot power supply.



Item	Label	Description
1	Robot Cable	Connects the robot to the power supply unit. Use the supplied robot cable.
2	Ethernet	Connects the robot to the controlling computer. The power supply unit houses a 10/100 BaseT Ethernet adapter and an RJ-45 receptacle connection. The Ethernet cable is not supplied.
3	Robot disable	Connects the emergency stop pendant to the power supply unit. Use the supplied emergency stop pendant cable.
4	Power inlet	Connects the power supply unit to the power source. Use the supplied power cord.

Ambient environment

Storage (non-operating)	Recommended range
Temperature	-20–50 °C
Humidity	0–90% RH, non-condensing

For the operating temperature and humidity specifications, see the Direct Drive Robot Data Sheet. The data sheet is available at the Automation Solutions web page at www.agilent.com/lifesciences/automation.

IMPORTANT The Direct Drive Robot must operate within the temperature and humidity specifications stated on the data sheet.

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Related publications

Related publications

The following guides contain additional information about the Direct Drive Robot and its operation:

- *BioCel System User Guide*. Provides information on setting up and operating the Direct Drive Robot.
- *VWorks Automation Control Setup Guide*. Provides information and procedures for defining labware and setting up labware inventory for the BioCel System.
- *VWorks Automation Control User Guide*. Provides information and procedures for using the VWorks Automation Control software to control the system.
- *VWorks Software Quick Start*. Provides an overview of how to use the VWorks Automation Control software.

All current user guides can be downloaded in PDF format at the Automation Solutions web page at www.agilent.com/lifesciences/automation. You can also search the Automation Solutions online [Knowledge Base](#) for related topics.

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